

The aluminum trihydrates manufactured according to the method in accordance with the invention preferably have a pore volume of 0.6 to 1.5 ml/g, preferably 0.8 to 1.1 ml/g.

- 5 The object of the invention is furthermore the use of the alumina ~~aluminum trihydrate~~ manufactured according to the method in accordance with the invention preferably as a catalyst support according to claim 17.

- 10 The method in accordance with the invention makes possible the synthesis of new type nordstrandite and gibbsite glycine, 0.25 to 0.3 wt% is to be considered as the optimal amount in the receiver applied to the hydrolysis receiver, in order to obtain as pure a nordstrandite phase as possible.

- 15 By utilization of different amino acids the connections between the nature of the side group of the amino acid employed and the trihydrate obtained are reflected. In many syntheses a mixture of bayerite, gibbsite and nordstrandite is obtained, as a rule however according to the method in accordance with the invention gibbsite and/or nordstrandite are formed.

- 20 The presence of amino acid compounds leads to aluminum trihydrates with increased pore volumes. Amino acids like L-leucin, glycine, L-serin, L-threonine, L-aspartic acid, L-glutamic acid, L-cysteine, as well as their dimers cysteine and homocysteine lead to formation of nordstrandite and/or gibbsite-similar materials.

- 25 In the use of L-leucin (side groups  $-\text{CH}_2\text{-CH}(\text{CH}_2)_2$ ) in the hydrolysis receiver a trihydrate with gibbsite structure precipitates. The same is true for L-cysteine, the dimer of cysteine and homocysteine in the hydrolysis receiver.

- 30 On the other hand glycine or amino acids with a hydroxide containing side group (L-serin:  $\text{R} = -\text{CH}_2\text{-OH}$ , aspartic acid:  $\text{R} = -\text{CH}_2\text{-COOH}$ ) preferably lead to precipitation in the nordstrandite form. Glycine, L-serin, aspartic acid and L-threonin preferably lead to precipitation in the nordstrandite form.

- 35 An increase of the amount of amino acid in the hydrolysis receiver can hinder the trihydrate precipitation up to the complete suppression in favor of formation of an amorphous boehmite. A further lowering of the amount of amino acid favors the

precipitation of bayerite. In the use of e.g. glycine, 0.25 to 0.3 wt% is to be considered as the optimal amount in the receiver applied to the hydrolysis receiver, in order to obtain as pure a nordstrandite phase as possible.

5

It is furthermore the object of the invention, the aluminumtrihydrates to undergo an aging process in a further step after the hydrolysis. The aging is preferable carried out between 30 °C and 100 °C, especially between 40 °C and 60 °C, preferably for a period of time of more than 1 h, preferably more than 2 h. Independently hereof the solid material concentration of the slurry to be aged amounts preferably to 2 to 17 wt%, preferably 3 to 5 wt%, calculated as  $\text{Al}_2\text{O}_3$  and in relation to the total weight of the slurry.

10

The alumina derivable from the new type of trihydrates described in this method is distinguished by having a pore volume greater than 0.6, preferably greater than 0.8 ml/g. A high product purity is achieved through the manufacture that is the hydrolysis of purified aluminum alcoholate. Through a smaller crystallite size than with conventional bayerite, the trihydrates are psrtially dispersable and consequently have very good processability to paste-like masses for manufacture by extrusion.

15

20

Alkaline solutions in the sense of the invention are aqueous solutions having a pH greater than 8, preferably 9-12. The alkaline pH value of the hydrolysis receiver can however be achieved by addition of suitable substances, such as e.g. ammonia, alkali solution or pH adjusting materials.

25

In accordance with the invention for the manufacture of aluminum trihydrates, aluminum alcoholates are employed. The aluminum alcoholate can for example be prepared by the Ziegler method, wherein preferably a purification takes place through filtration. As aluminum alcoholates  $\text{C}_1$  to  $\text{C}_{24}$  alcohols or their mixtures can be employed.

30

Examples:

Example 1a (Comparison example)

35

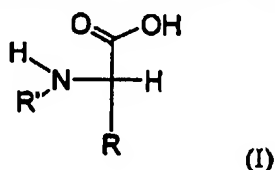
457 g of water and 23 g of a 25% ammonia solution were warmed to 30 °C in a 2 l three-neck flask. Into this receiver 400 g of aluminum hexanolate were added

### CLAIMS

1. A method for the manufacture of aluminum trihydrates by hydrolysis of aluminum alcoholates at 0 °C to 60 °C in aqueous solution with a pH value greater than 8 by addition of organic compounds having 2 to 24 carbon atoms or their salts, which each taken by itself has at least one amino group and at least one carboxyl group.

2. The method in accordance with claim 1 characterized in that the organic compounds have an amino group in the 2, 3 or 4 position, preferably in the 2 position, to the carboxyl group.

3. The method in accordance with one of the preceding claims characterized in that the organic compound is an amino acid of general formula I



with R equal to H or a hydrocarbon group with 1 to 20 carbon atoms with if necessary one or a plurality of functional groups, and R' equal to H, or a C<sub>1</sub> to C<sub>5</sub> alkyl with if necessary one or a plurality of functional groups.

4. The method in accordance with one of the preceding claims characterized in that the organic compound has furthermore at least one hydroxyl group.

5. The method in accordance with one of the claims 1 through 3, characterized in that the organic compound is L-serin, aspartic acid, glycine and/or L-leucin.

6. The method in accordance with one of the preceding claims characterized in that the organic compound is present at 0.01 to 1 wt%, preferably at 0.2 to 0.5 wt% in relation to the hydrolysis receiver.

7. The method in accordance with one of the preceding claims characterized in that the manufactured aluminum trihydrates have a nordstrandite or gibbsite structure.

- 5
8. The method in accordance with one of the preceding claims characterized in that the hydrolysis is carried out at temperatures between 20 °C and 60 °C, preferably between 30 °C and 40 °C.
9. The method in accordance with one of the preceding claims characterized in that aluminum alcoholates are added to the hydrolysis receiver in a weight ratio of 1 to greater than 0.5, preferably 1 to 0.7 to 1 to 3.
- 10
10. The method in accordance with one of the preceding claims characterized in that in a further step after the hydrolysis the aluminum compound undergoes a hydrothermal aging, preferably above for at least 1 h.
11. The method according to claim 10, characterized in that the hydrothermal aging at temperatures is carried out between 30 °C and 100 °C, preferably between 40 °C and 60 °C.
- 15
12. The method according to one of claims 10 or 11, characterized in that the hydrothermal aging is carried out in a solid material slurry with a solid material concentration from 2 to 25 wt%, preferably 3 to 5 wt%, calculated as  $\text{Al}_2\text{O}_3$  and in relation to the total weight of the solid material slurry.
- 20
13. The method in accordance with one of the preceding claims characterized in that the method furthermore comprises the step of calcining of aluminum trihydrates with predominantly bayerite, nordstrandite and/or gibbsite structure for the manufacture of calcined alumina.
- 25
14. The method in accordance with claim 13, characterized in that the method comprises the calcining of aluminum trihydrates with predominantly nordstrandite and/or gibbsite structure.
- 30
15. Alumina obtainable from aluminum trihydrates, manufacturable according to the method in accordance with claim 13 or 14, wherein the calcined alumina has pore volumes greater than 0.6.
- 35
16. Alumina in accordance with claim 14, wherein the calcined alumina has pore volumes of 0.8 to 1.5 ml/g.

17. Use of the aluminum trihydrate in accordance with claim 15 or 16 as a catalyst support.

5

10

15

20

25

30

35